APPENDIX B

Provisional Patent Application

6391-709:

Title: REMOTE SOFTWARE FOR MONITORING AND MANAGING ENVIRONMENTAL MANAGEMENT SYSTEM

Invs: Ahmad Nouri

THe following documents are attached and form part of this disclosure:

1. *Maestro Recovery Manager Analysis - Problem Statement*, pp. 1-10.

2. *Remote Interface Board Specification,* Revision 2 13-000072-01, June 21, 1996, pp. 1-11.

Multiple Node Service Processor Network

A means is provided by which individual components of a system are monitored and controlled through a set of independent, programmable microcontrollers interconnected through a network. Further means are provided to allow access to the microcontrollers and the interconnecting network by software running on the host processor.

Fly-by-wire

A means is provided by which all indicators, push buttons and other physical control means are actuated via the multiple node service processor network. No indicators, push buttons or other physical control means are physically connected to the device which they control, but are connected to a microcontroller, which then actuates the control or provides the information being monitored.

Self-Managing Intelligence

A means is provided by which devices are managed by the microcontrollers in a multiple node service processor network by software running on one or more microcontrollers, communicating via the interconnecting network. Management of these devices is done entirely by the service processor network, without action or intervention by system software or an external agent.

Flight Recorder

A means is provided for recording system events in a non-volatile memory, which may be examined by external agents. Such memory may be examined by agents external to the network interconnecting the microcontrollers.

Replicated components: no single point of failure

A means is provided by which no single component failure renders the monitoring and control capability of the system inoperable.

Extension by serial or modem gateway

A means is provided allowing an external agent to communicate with the microcontrollers by extending the interconnecting network beyond the physical system.

Software means are provided to monitor and/or control a system using a remote agent. Means are provided for implementing an extension to the interconnecting network, converting protocols between media and communicating with and directing the microcontroller, and the state managed by those microcontrollers.

The following provisional patent applications, commonly owned and filed on the same day as the present application, are related to the present application and are incorporated by reference:

COMPUTER SYSTEM HARDWARE INFRASTRUCTURE FOR HOT PLUGGING MULTI-FUNCTION PCI CARDS WITH EMBEDDED BRIDGES (6391-704); invented by:

Don Agneta
Stephen E.J. Papa
Michael Henderson
Dennis H. Smith
Carlton G. Amdahl
Walter A. Wallach

COMPUTER SYSTEM HARDWARE INFRASTRUCTURE FOR HOT PLUGGING SINGLE AND MULTI-FUNCTION PC CARDS WITHOUT EMBEDDED BRIDGES (6391-705); invented by:

Don Agneta
Stephen E.J. Papa
Michael Henderson
Dennis H. Smith
Carlton G. Amdahl
Walter A. Wallach

ISOLATED INTERRUPT STRUCTURE FOR INPUT/OUTPUT ARCHITECTURE (6391-706); invented by:

Dennis H. Smith
Stephen E.J. Papa

THREE BUS SERVER ARCHITECTURE WITH A LEGACY PCI BUS AND MIRRORED I/O PCI BUSES (6391-707); invented by:

Dennis H. Smith
Carlton G. Amdahl
Don Agneta

HOT PLUG SOFTWARE ARCHITECTURE FOR OFF THE SHELF OPERATING SYSTEMS (6391-708); invented by:

Walter A. Wallach
Mehrdad Khalili
Mallikarunan Mahalingam
John Reed

REMOTE SOFTWARE FOR MONITORING AND MANAGING ENVIRONMENTAL MANAGEMENT SYSTEM (6391-709); invented by:

Ahmad Nouri

REMOTE ACCESS AND CONTROL OF ENVIRONMENTAL MANAGEMENT SYSTEM (6391-710); invented by:

Karl Johnson
Tahir Sheik

HIGH PERFORMANCE NETWORK SERVER SYSTEM MANAGEMENT INTERFACE (6391-711); invented by:

Srikumar Chari
Kenneth Bright
Bruno Sartirana

CLUSTERING OF COMPUTER SYSTEMS USING UNIFORM OBJECT NAMING AND DISTRIBUTED SOFTWARE FOR LOCATING OBJECTS (6391-712); invented by:

Walter A. Wallach
Bruce Findley

MEANS FOR ALLOWING TWO OR MORE NETWORK INTERFACE CONTROLLER CARDS TO APPEAR AS ONE CARD TO AN OPERATING SYSTEM (6391-713); invented by:

Walter A. Wallach
Mallikarunan Mahalingam

HARWARE AND SOFTWARE ARCHITECTURE FOR INTER-CONNECTING AN ENVIRONMENTAL MANAGEMENT SYSTEM WITH A REMOTE INTERFACE (6391-714); invented by:

Karl Johnson
Walter A. Wallach
Dennis H. Smith
Carl G. Amdahl

SELF MANAGEMENT PROTOCOL FOR A FLY-BY-WIRE SERVICE PROCESSOR (6391-715); invented by:

Karl Johnson
Walter A. Wallach
Dennis H. Smith
Carl G. Amdahl

Problem Statement

♦ Introduction

Maestro Recovery Manager(MRM) is a software which locally or remotely manage a Raptor when a server is down or up, operating system died, LAN communication failed, or other server components failed .

User will be able to manage the server in very simple, usable, and friendly GUI environment. MRM use modem for remote and serial communication port for local to communicate with server for diagnostic and recovery.

Primary role of remote management is diagnosing and restoring service as quickly as possible in case of a service failure.

System administrator, LAN administrator in customer shop and NetFrame Technical support will be primary user for the system.

♦ Requirement Sources

MRM requirements comes from the following

1 - Focus Group (Customer Support and Training)
2 - User Walkthrough held by MRM team and Customer Support in Dec 96
3 - Down System Management Road map (96)
This road map is preliminary road map combined with Up System Management road map.
4 - MRM Road Map 97-98
This Road Map presented to Engineering Council Meeting on Mar 10, 1997.

5 - Raptor System, A Bird's Eye View.
6 - Raptor Wire Service Architecture

The following requirements have been identified for MRM

♦ Support Remote Management for Diagnostic and Recovery

Remote Management cover remote access to the Raptor Out Of Band management features. Remote Management will use Out of Band ,**Control Diagnostic and Monitor Subsystem (CDM)** remote management to cover the other high value added remote management functions. primary role of remote management is diagnosing and restoring service as quickly as possible in case of service failure.

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- **Support Remote Management ...** (continue)

The control of Raptor is completely "Fly By Wire" - i.e. no physical switch directly controls any function and no indicator is directly controlled by system hardware. All such functions referred to as "Out of Band " functions are controlled through a CDM. CDM basic functions are available so long as A/C power is available at the input to any of the power supplies.

CDM Subsystem supervises or monitors the following system features.

- **Power supplies** - Presence, status, A/C good, Power on/off and output voltage.
- **Environment** - Ambient and exhaust temperatures, Fan speed, speed control, Fan fault and overtemp indicators.
- **Processor** - CPU Presence, Power OK, Overtemp and Fault, NMI control, System reset, Memory type/ location and Bus/Core speed ratio.
- **I/O** - I/O canister insertion/removal and status indicator , PCI card presence, PCI card power and smart I/O processor Out Of Band control.
- **Historical** - Log of all events, Character mode screen image, and Serial number

- **Support for Object Oriented Graphic User Interface**

OO-GUI is graphic user interface with the following characteristic.

- **User task oriented**
  It uses tasks which user familiar and daily working with. User does not need to learn the tasks.
- **User objects**
  It uses objects which user working with during her or his daily work.
- **Simplicity and useablity**
  It is very simple to use and does not need long learning period.
- **Point and click with context sensitive help**
  Context sensitive help and point and click will help user to be very productive and get any information he needs on specific object or field or subject.
- **Drag and drop**
  Drag and Drop capability works with user object very well to accomplish the tasks.

♦ Release Requirements (MRM V2.0, 4Q96)

Maestro Recovery Manager (MRM)will support the following features locally through serial port and Wire Service Remote Interface card on the **Raptor16**.

MRM provide user friendly GUI with point and click capability to perform the following tasks which reviewed and accepted by the **Focus Group** for 4Q96 release.

- **Power On /Off**
  MRM support Power On/Off the server.
  User can do this task by right mouse click on the server object in the screen and see the result.

- **Display Flight Recorder.**
  While the server is working , Wire Service record all the server information in the 64K NVRAM. After the server failed, MRM will display the system log recorded in the NVRAM. User can evaluate the information and find the cause for the server failure. This can be done by right mouse click on the Flight Recorder object in the screen.

- **System Reset**

  MRM support rebooting the server by right mouse click on the server object in the screen. This is warm reboot of the server and works as pushing the "reset" button on the server.

- **Save**

  MRM will support saving Flight Recorder data, so user can send the file to the technical support for further diagnostic and recovery. It also can save the response for any Wire Service command failure.

- **On Line help**
  MRM will support online help contains overview, Getting Started, MRM tasks, Diagnostic and Recovery, and BIOS help.

- **B0 back plane support**

  MRM will support the server with B0 back plane . Server with B0 back plane display wrong time stamp. MRM uses NetWare 4.11 Operating system time stamp to display correct time stamp.

♦ Release Requirements (MRM V2.1, 1Q97)

Maestro Recovery Manager (MRM) will support Raptor16 Phase 2 for next release as follow. This release will delivered to customer by NetFrame Customer Support on CD.

MRM V2.1

MRM V 2.1 will support the MRM V2.0 plus the following new features for next release.

- **User Walkthrough Requirements held on Dec 17, 1996**
- **Recovery and Diagnostic help.**
  This help enable the user to display help based on message source or severity (fatal error, error, warning,). In each case the help inform the user the cause for the error and what steps to take to solve the problem.
- **C0 /E18 back plane support**
- **New C0 back plane Wire Service, Diagnostic, and BIOS message structure**

♦ Release Requirements (MRM V2.2 , 2Q97)

MRM V2.2 for Raptor 16

MRM V2.2 will support MRM V2.1 plus the following new features.

- **Remote connection via modem**

  MRM supports remote connection to an NF9000-16 via an external modem. MRM needs one external modem for client side and one external modem for the server side. The client modem can be installed and set up via the Windows NT/95 standard control panel/Modems installation. The server side modem has to be set up and connected to the server. Details of installation and setup for the modem are provided in the **NF9000 Maestro Recovery Manager Installation Guide.**

  MRM does not support internal modems.

  The following **external Hayes compatible** modems have been tested and worked with MRM.

  * **Client Modem**

    US Robotics Sportster 33.6 Fax modem

    ZOOM fax MODEM V.34X 33.6

  * **Server Modem**

    ZOOM fax MODEM V.34X 33.6

- **System Status**

  MRM supports **retrieve and update** of the system status components. System status comprised of the following components.

  * **Power Supplies**

    The following information will be displayed for this feature.

    1. Presence
    2. Status(ACOK, DCOK)
    3. Power On/off
    4. Output voltage (Analog measure of main supply + VREF)

NetFrame System
Ahmad Nouri
Confidential

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* **Temperatures**

We will support four types of temperature for 5 sensors and display Operating (10 -35 degree C) and None-operating (-40 to 70 degree C).

1. Temperature of all sensors
2. Warning temperature
3. Shutdown temperature
4. System over temp

* **Fans**

There are different type of fans in the system such as system fan and canister fan. All of them have the common following characteristics.

5. Speed (speed data)
6. Control (LOLIM, can be set to LOW or HIGH)
7. Fault (LED, Bits)

* **Processors**

There are 4 CPU in the Raptor16 with the following parameters.

1. CPU presence
2. CPU Power OK
3. System over temp
4. System Fault
   If system over temp or CPU internal error or system power failure.
   then wire service report System Fault
5. CPU Error
   If internal CPU error occurred , then report CPU error
6. CPU NMI control
7. System Board Bus/Core speed ratio

* **I/O Canisters**

There are four canisters available

1. I/O canister (insertion, removal)
   This shows presence bits for canister.
2. PCI cards
   This reflect PCI card slots [1-4] presence
3. PCI card power
   This controls canister PCI slot power

* **Serial Numbers**
  This is the last known serial data for the following server parts

  1. Back plane
  2. Canister 1-4
  3. Remote Interface (not implemented)
  4. System Board
  5. Power supply 1-2

* **Revisions**

  MRM will support the following chips revision

  1. Back Plane
  2. System board
  3. Power Supply 1- 2
  4. Canisters 1- 4
  5. Local Interface
  6. Remote Interface

- **Context-sensitive Help**

  All elements in the window such as icon, entry field, push button, and radio button have context-sensitive help. This help contains the following type.

  * **What's this**

    It shows description of each elements in the window which it is not disabled. This can be accomplished by right mouse click on each element in the window.

  * **Help push button.**

    This display general help for all windows.

  * **F1 Key**

    The key displays the help for any entry field in the window.

- **Print**

  MRM supports printing of flight recorder based on all messages, warning & errors, and errors with one type of font.

- **Password**

  Wire Service password is originally set by Manufacturing to "NETFRAME" (case sensitive) for every NF9000-16 server.
  MRM provides a **password changing** mechanism for the Wire Service system. For security purposes , MRM only allows the password to be changed via the **local** serial port connection and **not** via the **remote** connection

- **Support B0/E18 on NT4.0 server**

  MRM supports **B0/E18** configurations by utilizing a time stamp software component which resides on the NT4.0 server.

  Installation instructions for the time stamp are provided in the **NTReadMe** file on a floppy disk packaged with MRM.

  MRM requires the NetFRAME NT Value Add software to operate.

  The NetFRAME NT Value Add software will automatically install the time stamp for you. If you have not installed NetFRAME NT Value Add, then you need to install the time stamp provided for you on the NTSup floppy disk.

- **Support for InstallShield**

  InstallShield setup software is used to install MRM on the client workstation.

- **Delivery**

  MRM package contains the following.

  * **NF9000 Maestro Recovery Manager CD release.**
    This CD contains MRM software and documentation.
  * **Two support floppy disks for NF9000-16 B0 back plane for NT and NetWare.**
  * **Boxes contain above items , Remote Interface Card, adapter, cables, and documentation.**

- **Dependency**

  MRM version 2.2 depends on the following items:

  - Remote Interface chip provided by Wire Service(Firm Ware) department.
  - Remote Interface card provided by Hardware Engineering department.
  - Remote Interface boxes, cables, and power adapters provided by Manufacturing.

♦ Release Requirements (MRM V2.2, 2Q97)

MRM V2.2 for Raptor 8

MRM V2.2 for Raptor 8 has the same features as MRM v2.2 for Raptor16 with the following different .

- **Support for C0 back plane and F18 BIOS**
- **System Status**

  The following components of System Status are different from MRM V2.2 for Raptor16.

  * **Power Supplies**

    1. User can not turn off and on specific power supply.
    2. Raptor 8 has three power supply.
    3. There are no DC (OK, BAD) for Raptor8.
    4. AC for all power supplies are good all the times.

  * **Fans**

    1. Four system board fans in front
    2. Two system board fans (Storage fans) in back
    3. Group A and group B sharing two fans.

  * **I/O Groups**

    1. Group A contains 4 PCI card slots
    2. Group B contains 4 PCI card slots.

  * **Serial Numbers**

    1. Serial number for Group A and B fans are the same.
    2. There is serial number for power supply # 3.

  * **Revisions**

    1. Group A and B fans have the same revision.
    2. There is revision for power supply #3

- **Delivery**

MRM package contains the following.

- **NF9000 Maestro Recovery Manager CD release.**
  This CD contains MRM software and documentation.

- **Boxes contain above items , Remote Interface Card, adapter, cables, and documentation.**

Remote

Interface Board

Specification

Revision 2
13-000072-01
June 21, 1996

Tahir Sheikh
NetFRAME Systems, Inc.

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Overview:

This board is an interface between Raptor Wire Services and an external modem. The system status and commands are passed through the RS232 connection at the modem side to the Wire Services bus, the I2C bus, controlled through an on board PIC16C65. The I2C signals are translated by the PIC16C65 into an eight signal RS232 protocol and passed through a voltage level translator LT1133A, with baud capable of reaching the speed of 120k. A 25 pin D-Sub connector resides on the other side of the voltage level translator.

The system status storage is through a 32Kx8 SRAM, with an external lath for latching the higher addressing bits of the data RAM. A signal powered EPROM is used for storing board ID information.

The board is powered through 7.5V and 700mA supply unit, and is an alternative source for the bias powered partition of the Wire Services. The bias powered block includes an NV-RAM and a PIC16C65 which are resident on the Raptor back plane. The power source is regulated through a high frequency switching regulator.

1.0 Features

The designed features are as follows:

1.1 I2C Interface

The two wires interface is brought from the Raptor and passed to the PIC16C65 using an RJ45. A bus extender 82B715 is connected between the external interface to the local I2C bus. Port C bit 3 is the clocking bit, and Port C bit 4 is the data line.

1.2 RS232 Protocol

The communication with the modem is based on the RS232. Microcontroller PIC16C65 is used to generate the receive and the transmit signals, where the signal levels are transposed to the RS232 levels by the LT1133A. The 3 transmit signals, RTS, SOUT and DTR are from Port A bits 2, 3 and 4, where as the 5 receive signals are from two ports, DCD, DSR from Port C 1,0 and SIN, CTS and RI from Port A 5, 0, 1.

The 25 pin RS232 pin connection is used instead a 9 pin connector, since this type of connector is more common than the other. All the extra pins are no connect except the pins 1 and 7, where pin 1 is chassis ground and pin 7 is a signal ground.

The connection through LT1133A can be run up to 120k Baud and is ESD protected to +/- 10kV.

The short voltage at the output can be +/- 30V and is isolated to the forward direction only.

1.3 PIC16C65 and 32Kx8

A 32Kx8 SRAM is available for storage and transfer between the internal Wire Services and the external remote interface. Port D is the address port, while an external 74ABT374 is for expanding the address range to 15 bits. Port B is the data bus for the bi-directional data interconnect. Port E is for the SRAM enable, output tristate and the write control signals.

The PIC16C65 is designed for a frequency of 12MHz. An LED is also connected to the Port C bit 5.

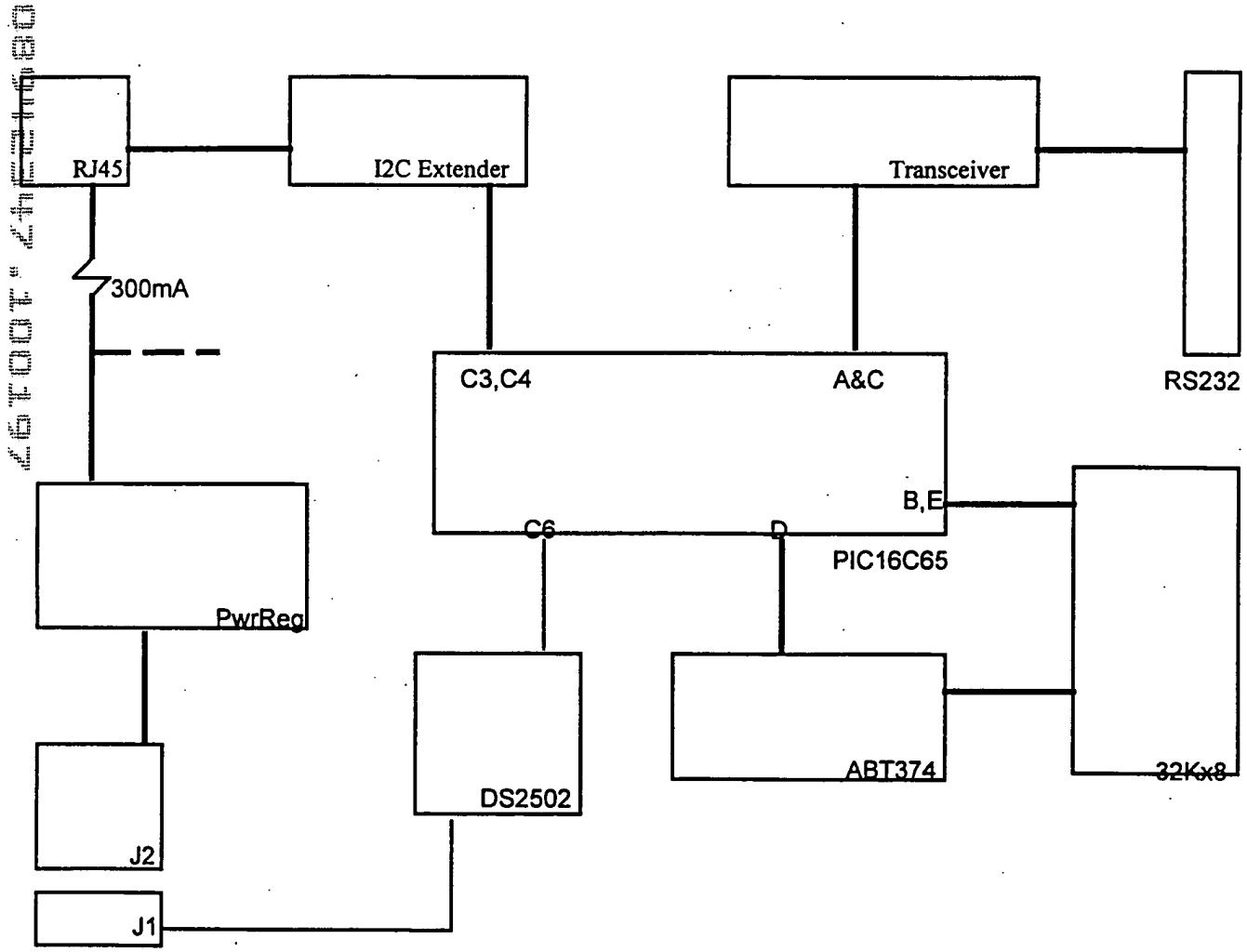

Figure 1: Remote Interface Interconnect

1.4 Serial ID EPROM

DS2502 is for storing board ID, connected to PIC16C65 Port C bit 6. The programming is handled through a jumper applied through connector J1. DS2502 is a signal powered, retaining the charge into a capacitor, sourced through the data line.

2.1 Alternative Power Source

The board is powered through 7.5V and 700mA (or 800mA which ever available) supply unit. After regulating the supply, it is an alternative source for the bias powered partition of the Raptor Wire Services. The bias powered block includes an NV-RAM and a PIC16C65 which are resident on the Raptor back plane.

The power source is regulated through a high frequency switching regulator based on Linear Technology LT1376. The input to the regulator circuitry is off a wall mounted adapter. The regulated output is consumed locally and 300mA are sourced to the Raptor Wire Services through a fuse and an RJ45 P1.

2.2 Power Consumption

The following is an average estimated power consumption with the board running at a base frequency of 12MHz.

PIC16C65	Microcontroller	30mA
82B715	I2C Extender	10mA
32Kx8	SRAM	80mA
LT1133A	Transceiver	70mA
374	Latch	30mA
	Misc.	60mA
		280mA
	Alt. Source	300mA

580mA

LT1376, L1, D2, D3, etc. 1.45 Watts max.

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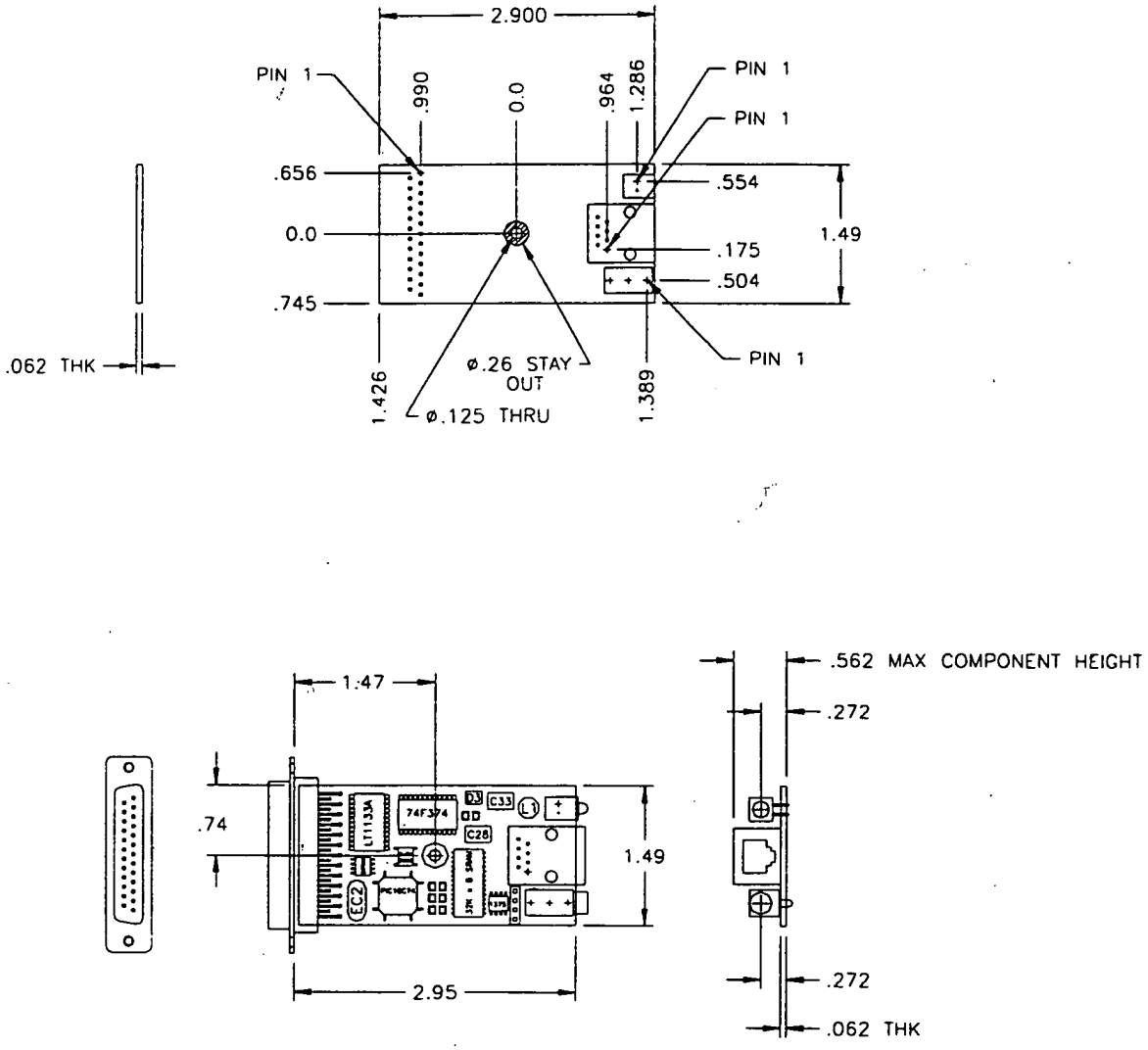

Figure 2: Mechanical Orientation

2.3 Board Layout

The board is based on controlled impedance of 60 Ohms +/- 10%, with 6 layers and test points for all signals. The width is restricted by the dimension of the RS232 due to the mounting constrains. The board is dual sided with active components kept on the top side only.

The high frequency bypass is kept with .1uf and .001uf, where the charge storage is kept by two 33uf and two 1uf capacitors.

The location and mounting of the power connector and the LED are kept such that the both sides of the cabinet are identical, therefore interchangeable.

3: Enclosure

The enclosure is planned to be Injection Molded Aluminum, a side view is in figure 3. Aluminum instead of plastic is selected due to the regulator heat, and EMI shielding.

The board connects at three locations between the top and the bottom enclosures. Two locations are based on the clamp shell design at the D-Sub and the RJ45, two opposite ends of the enclosure. The third location is a mounting hole in the center of the enclosure.

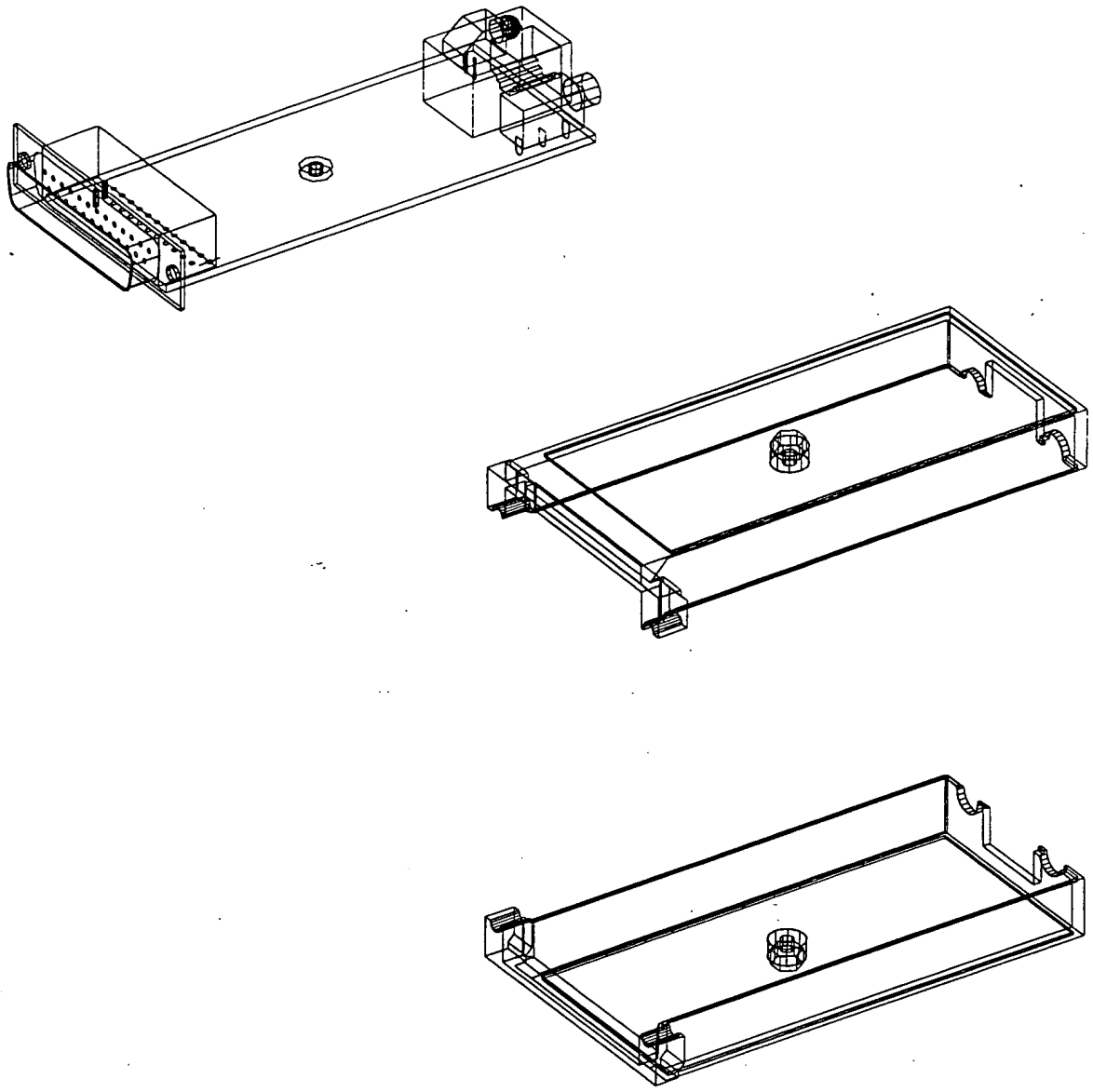

Figure 3: Board and Enclosure Isometric View

4.0 Environment

The environmental specification is based on assumptions:

The environment is Ground Fixed.
The "Quality Level of II" is used.
Bellcore Method I, Parts Count Method, Case 2 for prediction.
Burn-in time 120 hours.
Operated at 40C and 50% rated electrical stress.

4.1 Environmental Specification:

MEAN TIME BETWEEN FAILURE

2.445250e+06 Hours

This number is calculated based on the Bellcore Technical Reference TR-NWT-000332, Reliability Prediction Procedure for Electronic Equipment, Issue 4, September 1992.

ALTITUDE

Operating	-100 to 10,000 feet
Non-Operating	-100 to 40,000 feet

HUMIDITY

Operating	10% to 80% R.H., Maximum Gradient 10% per hour
Non-Operating	5% to 90% R.H., Maximum Gradient 10% per hour

TEMPERATURE (ambient)

Operating	10 to 40 degrees C Maximum Gradient 10 degrees C per hour
Non-Operating	-40 to 70 degrees C Maximum Gradient 10 degrees C per hour

SHOCK

Operating

Magnitude	2 G's (peak)
Duration	11 ms
Waveform	Half Sine

Non-Operating

Magnitude	10 G's (peak)
Duration	11 ms
Waveform	Half Sine

VIBRATION

Operating

Frequency Range	5 to 500 Hz
Magnitude	0.010 inch peak to peak displacement
Acceleration	0.20 GÕs peak

Non-Operating

Frequency Range	5 to 500 Hz
Magnitude	0.010 inch peak to peak displacement
Acceleration	0.50 GÕs peak

DROP (PACKAGED)
ASTM D4169

ELECTRICAL

Nominal Line	115 VAC or 230 VAC @ 50/60 Hz autoranging
Line Deviation	90-130 VAC & 180-256 VAC @ 47-63 Hz
Line Transient/Surge Susceptibility	1.25 x highest rated nominal voltage or 300 Vrms, whichever is less, for 1 second.

ELECTRO-MAGNETIC COMPATIBILITY

FCC, Class A under FCC Rule 15, Subpart B, conducted and radiated.

Canadian Radio Interference Regulations, C.R.C., c.1374, Sec. 2, as amended in The Canadian Gazette, Part II, Vol. 122, No. 20, dated Sept. 28, 1988.

European EMC Directive (89/336/EEC) CISPR 22 (Class B).

IEC 801-2:1984 8 kV air discharge

IEC 801-3:1984 3 V/m, 27-500 MHz

IEC 801-4:1988 1 kV mains, 500 V other.

SAFETY AGENCIES
UL, CSA, VDE, JIS

Electrostatic Discharge

Air Discharge	2.5 to 5.0KV	no errors allowed
	5.1 to 10.0 KV	recoverable errors through system allowed
	10.0 to 20.0KV	recoverable errors through power cycling allowed
Contact Discharge	0 to 8.0KV	recoverable errors through power cycling allowed